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MARINE SCIENCE SPECIAL

OCEAN IN DANGER

WHY MARINE SCIENCE IS MORE IMPORTANT THAN YOU THINK

The marine world is in peril – from the attack of Nomura jellyfish swarms to overfishing and coral bleaching – putting the underwater ecosystem at risk. If you think only affects ocean-goers, think again. These are just some of the problems that marine scientists are trying to solve.

ALIEN INVADERS

What: Nomura jellyfish swarm
Why it matters: Jellyfish have already decimated the Black Sea's billion-dollar industry and Ireland's salmon farms, and now Japan's feeling the pressure from the Nomura.

At this very moment, Japan's oceans are silently being invaded by giant, floating aliens: the Nomura jellyfish.

These 200kg monsters are nothing new, and massive invasions or "blooms" (with hundreds of thousands seen at a time) would only happen once in a lifetime. However these days, Nomura are now an annual threat.

In their wake, they devour huge amounts of plankton, the cornerstone of the marine food chain, decimating entire fish populations. They are the bane of Japanese fishermen; they poison any fish they touch, and at 200kg, accidentally netting just a few can capsize a fishing boat.

They also clog and destroy machines, disabling everything from water filtration systems to a nuclear power plant's cooling system. It sounds unbelievable, but with possible scenarios of Nomura population explosions, it's plausible they could destroy the world's marine ecosystem as we know it.

The invasive Nomura jellyfish destroys fish populations

EMPTY OCEANS

What: Overfishing
Why it matters: Overfishing + food wastage could lead to shortage of supply, higher prices and the collapse of marine life.

Globally, 25% of fishing grounds are already exhausted. And yet the global fishing industry as a whole is so poorly run and regulated, that to get 1kg of shrimp to your table, 10kg of marine life is caught, killed and discarded – constituting just part of the 27,000,000 tonnes of fish we waste annually.

Keeping only the fin

A high-profile case of population collapse is the killing of millions of sharks (using just the fins and discarding the body) simply to make soup, a practice which reduces the apex predators of the ocean, and causes the death of many coral reefs. Or eco tragedies like the over-fishing of the Patagonian toothfish into actual extinction in just 2 short years. Gone are the days when sustainable fishing is practised, as in the case of the dwindling Ama-chan divers of Japan who catch seafood without the aid of an air supply – their approach to fishing will soon go extinct with the last of the working women.

With our global population on the rise, how do we manage the ocean population to sustain and feed us for the long run? Good question.

The Pantagonian toothfish – extinct in just 2 years

SNOW WHITE

What: Coral Bleaching
Why it matters: Coral protects shorelines and could provide the next medical breakthrough.

Coral reefs are the richest, most vibrant ecosystem in our oceans and are in fact huge, living underwater cities. The colours you see are the algae that live in their tissues – without them, corals would turn 'bleached' or white, which leave them very vulnerable.

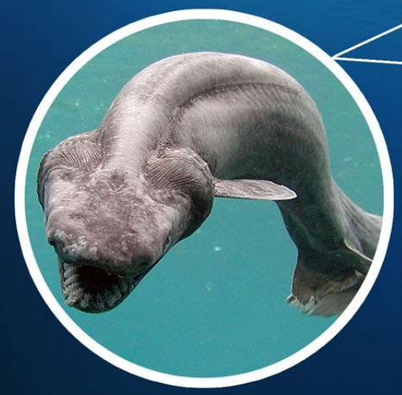
When temperatures rise or fall according to normal weather patterns – like El Nino and La Nina – bleaching happens. With global warming, the bleaching becomes erratic and can affect marine life and the fishing industry (and all who eat seafood) that depend on it. Without coral reefs, there would be no shoreline buffer against waves, storms and floods; it even leads to coral litter on beaches, meaning countries that survive on beach tourism would be hit hard.

Together with melting ice, rising waters and super-storms, coral bleaching is one of the most devastating side effects of global warming on our seas.

Global warming causes coral bleaching

WHAT LIES BENEATH

Icy cold, pitch black and largely unexplored, the harsh deep sea is no playground for humans but it is definitely home ground for some of the most bizarre animals. With physical characteristics like glowing eyes, oddly long tentacles or even razor-sharp fangs, it is hard to believe that these animals exist but they actually do, and some of them even have roots dating back to prehistoric times.



FRILLED SHARK *(Chlamydoselachus anguineus)*

This eel-like fish has its ancestors tracing back to the days dinosaurs walked the earth. The Frilled Shark, which can be found in the depths of 1.5km and grow up to 2m long, got its name from the frill-like gills that cover its sides – which is said to look like a ruffled pirate collar. Feeding on squid, fishes and other smaller sharks, the Frilled Shark can be found in Pacific Ocean and some parts of Atlantic Ocean.

BARRELEYE *(Macropinna microstoma)*

Also known as the Spookfish, the barreleye comes with a transparent head and tubular eyes, which allows it to rotate its eyes within the socket, giving this fish the advantage to scout for its prey - like tiny jellyfish and crustaceans - from any angle. Inhabiting the depths of over 1km where darkness reigns, this ghostly-looking fish (which are no longer than 20cm) can be found specifically in the Pacific Ocean.

DUMBO OCTOPUS *(Grimpoteuthis)*

Not as grody looking as other deep-sea creatures, the Dumbo Octopus has over 30 species that range from 20cm to 2m. Living at depths of 7km, the dumbo octopus hovers over the seabed feeding on small crustaceans and worms. It gets around by flapping its elephant ear-like fins, and when the dainty octopus is attacked, it thrusts its tentacles forward and shoots out a jet of water. Found in most oceans, the dumbo octopus is probably the deep sea's cutest denizen.

VIPER FISH *(Chauliodus sloani)*

Looking like it stepped out of the Alien vs Predator flick, the viperfish is easily recognised from its needle-like fangs that protrude from the edge of its mouth. Trolling the depths of over 4km, this savage-looking fish reaches lengths of up to 60cm, and attracts its prey by emitting light from its belly. Feeding mainly on crustaceans and small fish, the viperfish is native to the northern Pacific Ocean and its body colour ranges from black and blue to green.

GIANT TUBE WORM *(Riftia pachyptila)*

Alternatively known as 'black smokers' because of the dark ink-like substance they eject, the giant tube worms – which reside in Pacific Ocean – can grow up to 2m and have no digestive tracts or mouths. Sharing a symbiotic relationship with the bacteria living inside them by depending on them for food, the worms reproduce by releasing their eggs into the water to be fertilised, after which the young larvae swims back down and attaches itself to rocks.

BLOBFISH *(Psychrolutes marcidus)*

Found largely in the deep seas of Australia and New Zealand, the football-sized blobfish is a rare species that can be found inhabiting the depths of 800m. Due to the pressure found in these depths, this sad-faced fish does not require muscle, so instead it looks like a blob of gelatinous mess. Hovering just above the seafloor, the blobfish feeds on crabs and sea pens by leaving its mouth open to let these critters drift in.

Exceptional Opportunities in Marine Science

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With an increasing focus on the role of oceans to provide food, pharmaceuticals and resources for our growing populations, the next generation of marine scientists will play a major part in ensuring we protect and manage our oceans. Careers range from marine biology to fishery management, oceanography and even biomedical science.

With more than 300 marine scientists and access to some of the most biodiverse marine habitats on the planet, The University of Queensland (UQ) is at the heart of marine research in Australia, and offers a unique and vibrant research and study environment for its students.

Located in Brisbane, UQ operates marine research stations in the tropics at Heron Island on the Great Barrier Reef and in the subtropics on Stradbroke Island in Moreton Bay, within easy access to the university's campus.

UQ's Heron Island Research Station

WORLD-CLASS MARINE SCIENCE RESEARCH

Using UQ's significant marine and laboratory research infrastructure, UQ scientists tackle a broad range of marine science issues. They also contribute to teaching and learning at undergraduate and postgraduate levels.

PROFESSOR CRAIG FRANKLIN

What: Salt water crocodiles

Why: Monitoring of crocodiles with remote sensing technology to track movement patterns and responses to changing environmental conditions.

PROFESSOR JUSTIN MARSHALL

What: Mantis shrimps

Why: Investigation of the unique visual system of mantis shrimps, cuttlefish, lungfish and other deep sea animals.

www.uq.edu.au/ecovis

ASSOCIATE PROFESSOR BRYAN FRY

What: Seasnakes

Why: Exploring novel toxins from venomous snakes (including sea snakes) for use as lead compounds in drug design and development.

ASSOCIATE PROFESSOR IAN TIBBETTS

What: Marine grazers

Why: Discovering the role herbivorous fish and invertebrates play in maintaining the balance between slower growing corals and faster growing algae.

DR. KATHY TOWNSEND

What: Marine turtles

Why: Investigating the effects of plastic waste on endangered marine turtles to inform future environmental policies on sea discharge of waste.

STUDYING MARINE SCIENCE AT UQ

UQ's Bachelor of Science (Marine Science major) will allow you to study a wide range of marine disciplines – from physical and molecular science and engineering through to ecology, nature conservation and global change science.

You can tailor your program to achieve your academic goals and career aspirations whilst gaining practical skills and hands-on experience in the field at UQ's research stations.

UQ's marine science graduates possess a skill-set which is transferable across marine-based industries globally.

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FIND OUT MORE ABOUT STUDYING MARINE SCIENCE AT UQ:

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Careers in marine science

Marine science graduates may find roles in many sectors, including:

- biomedical science and biotechnology
- ecotourism
- education
- engineering and consulting
- fisheries research
- food technology
- marine parks
- marine resource development
- museums
- oil companies
- pharmaceuticals
- planning and management
- power-generating authorities
- the fishing industry
- universities & marine science institutes
- wildlife conservation

Marine-based industries are worth more than $16 billion annually and offer broad scope in the variety of job opportunities available to graduates.

YOUNG SUPERHEROES OF SCIENCE

You may have heard about scientists who've invented life-saving devices, discovered alternative fuel sources or made the internet a better place to surf, but you may be surprised to find that many of these scientists made it big before they were even out of their teens.

JACK ANDRAKA (16 years old)

An average teen who loves to kayak, Jack's invented a revolutionary test for pancreatic cancer that's 168 times faster, 26,000% cheaper and more accurate than any test on the market. It's one of the toughest cancers to detect – it's what killed Steve Jobs – and there's a 1 in 70 chance you can get it.

At age 14, he wrote to 200 different research labs with his theory of using nanotubes to detect cancer cells, and got rejected by 199 labs before Johns Hopkins said yes. He then interned nights, weekends and holidays for months to finish his invention, which could be in the market in the next 5-10 years.

ISHA JAIN (22 years old)

Isha was mapping the chemical structures of candy before the age of ten; a breakthrough experiment which is now used in secondary school chemistry lectures around the world.

By age 16, she had published 6 scientific papers, won a $100,000 research grant after determining the cause of rapid bone-growth spurts, and was consulting Harvard University on its Symposium for the Advancement of Women in Science. Today, at age 20, she's one of the most promising young scientists in the world, as well as an accomplished dancer, nationwide beauty pageant winner and avid athlete.

PEYTON ROBERTSON (11 years old)

At only 11 years old, Peyton Robertson's revolutionised the humble sand bag. Incredibly useful in an emergency flood, they're traditionally heavy (18kg) and hard to transport.

Peyton's sandbags are filled with a mixture of salt and polymer – the recipe of which he tested at beaches and bathtubs until he achieved a ratio that weighs 2kg when dry but expand to 15kg when wet. Plus, his bags are designed to interlock with each other, thus creating a seamless barrier. And when the bags are dry, they can be reused again. As a tournament golfer, he has also invented a golf ball warming device for golfing in colder weather.

SARA VOLZ (17 years old)

By age 17, Sara Volz had figured out how to generate biofuel from the oils in algae by growing them in glass flasks under her bed.

This technology may save millions of hectares of rainforest from being cut to make way for so-called "biofuels" (algae can be grown in areas not used in agriculture), and it can also be grown using wastewater while absorbing large amounts of carbon dioxide, thus reducing the impacts of climate change while powering vehicles of the future.

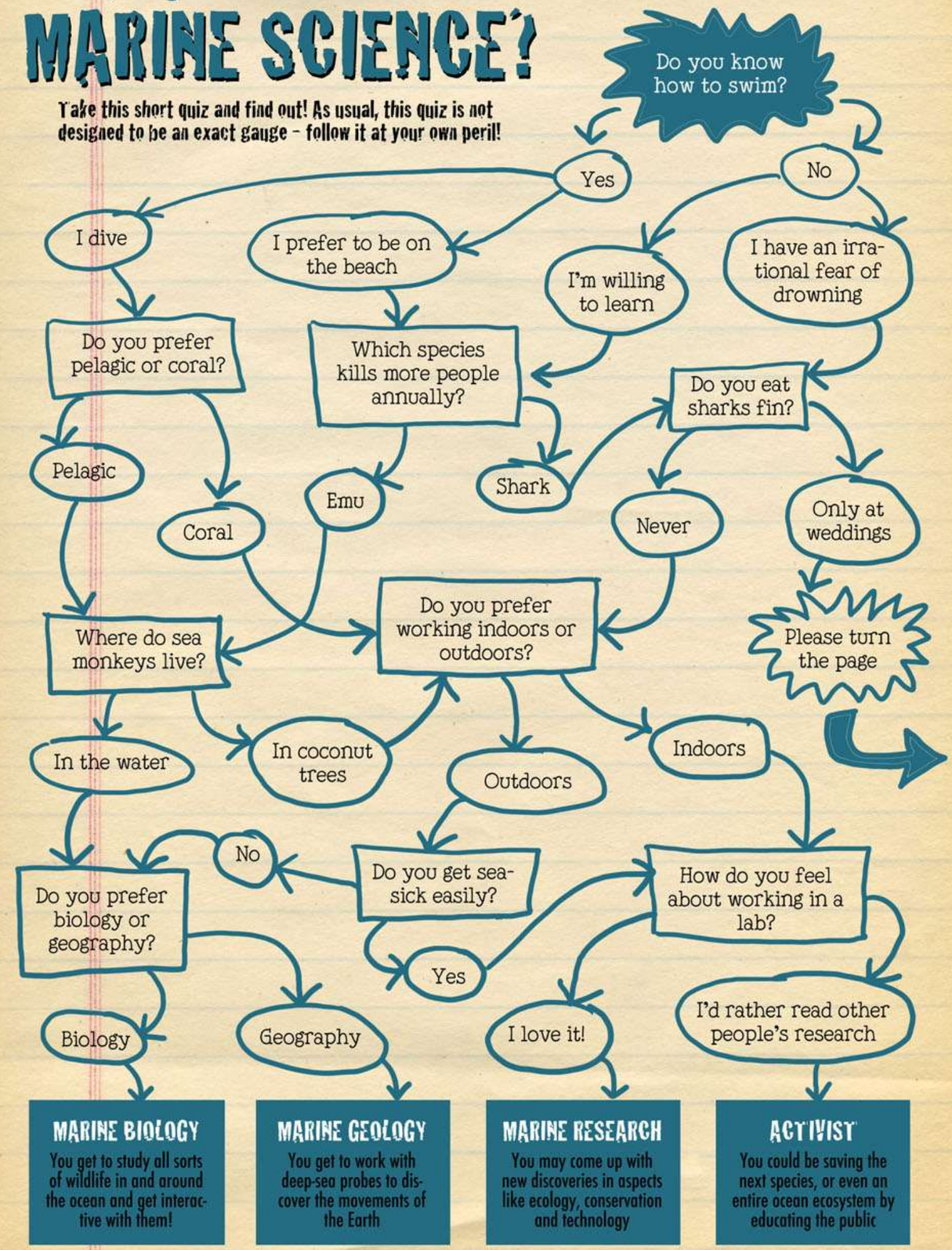
LUIS VON AHN (27 years old)

At age 27, millionaire-entrepreneur and Carnegie Mellon Professor Luis von Ahn developed scientific ways to crowd-source answers from humans for problems that are too complex or subtle for computers to solve.

For example, how do you accurately label every single image on the internet so you can do a more accurate Google search, when even super-computers can't understand what differentiates a #funnycatpicture from a dud? You make it into a game for people join. Wanna play? Check out espgame.org.

Are you cut out for MARINE SCIENCE?

Take this short quiz and find out! As usual, this quiz is not designed to be an exact gauge – follow it at your own peril!



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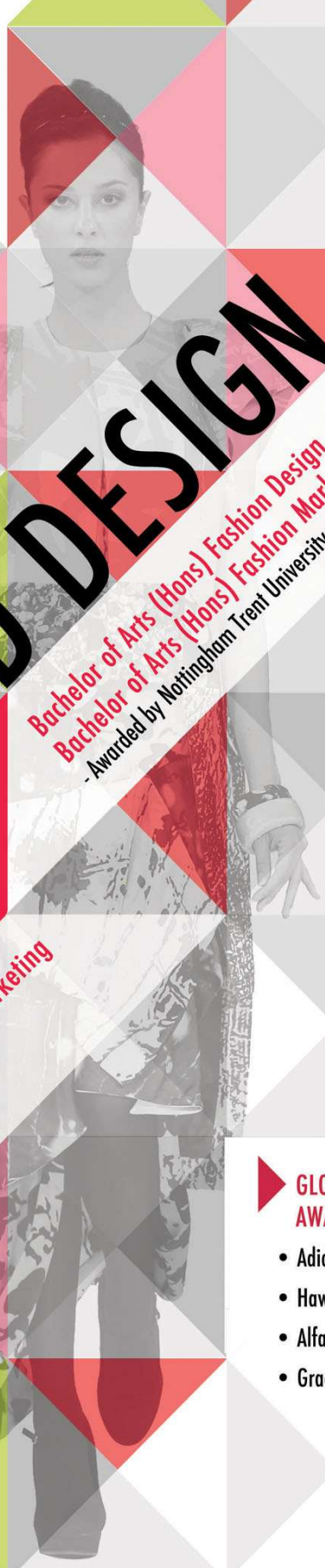

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